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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/828,386	04/20/2004	Khurram Muhammad	TI-34777	4826
23494	7590	10/18/2006	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			DSOUZA, JOSEPH FRANCIS A	
			ART UNIT	PAPER NUMBER
			2611	

DATE MAILED: 10/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/828,386	MUHAMMAD ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Adolf DSouza	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 24 April 2004.
- 2a) This action is FINAL.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1 - 21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1 - 13, 15 - 21 is/are rejected.
- 7) Claim(s) 14 is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 20 April 2004 is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All    b) Some \* c) None of:
  1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date: _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date: _____   | 6) <input type="checkbox"/> Other: _____                          |

***Drawings***

1. The drawings are objected to because in Figure 6, the labeling on the frequency axis is not correct. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

2. The abstract of the disclosure is objected to because the paragraph number [040] should be removed. Correction is required. See MPEP § 608.01(b).

3. The disclosure is objected to because of the following informalities:

- On page 6, the description of the drawings for Figures 1 and 3 are too general.  
They should be changed to more closely reflect what the drawings show.
- On page 1, paragraph 1 and page 8, paragraph 27 of the specification, the serial Number for the Related Patent Application should be entered.

Appropriate correction is required.

### ***Claim Objections***

4. Claims 9, 14 and 16 are objected to because of the following informalities:

- In claim 9, the claim states that the pole is determined by the ratio of its rotating capacitor to its history capacitor. However, in the specification, page 8, last 4 lines, the pole is determined by “the ratio of the rotating capacitor to the sum of the rotating capacitor and history capacitor.”
- In claim 14, the phase “[Expression 2]” should be removed.
- In claim 16, the claim states that “an IIR filter is coupled to the input node”. However, in Figure 1, 4 IIR filters 12, 14, 16 and 18 are shown coupled to the input node.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claim 2 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding claim 2, the specification does not disclose a method where only two phases are used. Instead the method described and shown in the drawings uses 4 phases. Paragraph 11 of the specification simply states that I and Q phases are used but no description is provided as to how only two phases are used.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1 – 3 are rejected under 35 U.S.C. 102(b) as being anticipated by Mole et al. (US 6,226,509).

Regarding claim 1, Mole discloses a method for complex image rejection filtering in a direct sampling mixer (column 3, line 61 – column 4, line 16) comprising the steps of:

sampling an RF input with multiple phases of a local oscillator clock, each of the local oscillator phases producing a discrete-time signal stream (Fig. 3, elements 30, 36 which shows I,Q,-I,-Q (38,40,42,44 respectively); column 7,lines 11 – 25);

processing the multiple phases of the discrete-time signal in multiple paths, the paths sharing among themselves the discrete-time samples, whereby a bandpass filter characteristic is achieved during the processing step, and whereby an RF image is substantially rejected (Fig. 3, circuitry after outputs 38, 40, 42, 44; column 3, line 61 – column 4, line 16; column 4, lines 53 – 62; Fig. 1, signal “Wanted” which is shown as the bandpass signal and signal “Image” which is rejected).

Regarding claim 2, Mole discloses the multiple phases of the local oscillator clock comprise two phases I and Q spaced approximately 90 degrees apart (Fig. 3, element 38 and 40; column 7, lines 11 – 25).

Regarding claim 3, Mole discloses the multiple phases of the local oscillator clock consist of four phases I+, I-, Q+, Q-, spaced approximately 90 degrees apart (Fig. 3, elements 38, 40, 42, 44; column 7, lines 11 – 25).

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 4 – 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mole et al. (US 6,226,509) in view of Hunsinger et al. (US 5,465,396).

Regarding claim 4, Mole does not disclose the discrete-time signal stream comprises charge packets.

In the same field of endeavor, however, Hunsinger discloses the discrete-time signal stream comprises charge packets (column 20, lines 5 – 8).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Hunsinger, in the system of Mole because this would allow for low power consumption, as is well known in the art.

Regarding claim 5, Mole discloses sharing the input signal..

The limitation that the discrete time input signal comprises charge packets is as analyzed in claim 4 above.

the step of sharing discrete-time samples further comprises the sharing of charge packets.

Regarding claim 6, Mole discloses the step of converting an RF input voltage into current (column 8, lines 40 – 43; Fig. 4, elements Q1, Q2, Q3 and Q4).

Regarding claim 7, Mole discloses a method for complex filtering in a direct sampling mixer (column 3, line 61 – column 4, line 16) comprising:

sampling an RF input with I and Q phases of a local oscillator clock (Fig. 3, element 38 and 40; column 7, lines 11 – 25);

processing the I and Q signals in separate signal processing paths (Fig. 3, elements 38 and 40);

sharing the I and Q signals between the signal processing paths, whereby a bandpass filter characteristic is achieved during the processing step, and whereby an RF image is substantially rejected (Fig. 3, circuitry after outputs 38, 40, 42, 44; column 3, line 61 – column 4, line 16; column 4, lines 53 – 62; Fig. 1, signal “Wanted” which is shown as the bandpass signal and signal “Image” which is rejected).

Mole does not disclose charge packets.

The limitation regarding charge packets is as analyzed in claim 4 above.

11. Claims 8 – 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mole et al. (US 6,226,509) in view of Staszewski et al. (US 20030035499).

Regarding claim 8, Mole discloses I+,I-,Q+ and Q- phases of the input signal and that the interconnections for rotation of filtered signals such that in combination the interconnected filters provide a complex filter (Fig. 3, element 38, 40, 42, 44 and processing of those signals to output 68; column 3, line 61 – column 4, line 16; column 4, lines 53 – 62;).

Mole does not disclose IIR filters.

In the same field of endeavor, however, Staszewski discloses an IIR filter (page 5, paragraph 61 – page 6, paragraph 67).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Staszewski, in the system of Mole because this would allow for an implementation that requires less hardware than an FIR implementation, as is well known in the art and also disclosed by Staszewski (paragraph 61).

Regarding claim 9, Mole does not disclose history capacitor, rotating capacitor and a buffer capacitor.

In the same field of endeavor, however, Staszewski discloses each IIR filter further comprises a history capacitor, rotating capacitor, and buffer capacitor adapted for

sampling, storing and transferring charge from the input signal (page 6, paragraph 66; page 7, paragraph 82); and wherein each IIR filter has a pole determined by the ratio of its rotating capacitor to its history capacitor and is adapted to provide filtering of an input signal (page 8, paragraph 83, last 5 lines).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Staszewski, in the system of Mole because this would allow for an implementation that requires less hardware than an FIR implementation, as is well known in the art and also disclosed by Staszewski (paragraph 61).

Regarding claim 10, Mole discloses two or more complex filter stages according to claim 8 coupled in a cascading configuration for providing high order filtering (Fig. 6; column 11, lines 51 – 57).

Regarding claim 11, Mole discloses one or more transconductive elements coupled between adjacent stages (Fig. 4, elements Q1, Q2, Q3, Q4; column 8, lines 40 – 43).

Regarding claim 12, Mole discloses one or more amplifier elements coupled between adjacent stages (Fig. 3, element 32; column 7, line 11 – 25).

Regarding claim 13, Mole discloses one or more buffer elements coupled between adjacent stages (column 10, lines 23 – 28; wherein the buffer elements is interpreted as the buffered polyphase stage).

Regarding claim 15, Mole does not disclose that the complex filter comprises a loop filter in a sigma-delta analog-to-digital converter.

In the same field of endeavor, however, Staszewski discloses the complex filter comprises a loop filter in a sigma-delta analog-to-digital converter (page 8, paragraph 88).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Staszewski, in the system of Mole because this would allow for dynamic range advantages, as is well known in the art.

Regarding claim 16, Mole discloses a circuit for image rejection filtering in a direct sampling mixer comprising:

an input node (Fig. 3, element 30, 34);

four parallel output nodes for producing four phases of an output signal (Fig. 3, element 38, 40, 42, 44);

a configuration for reading the phase signal components in rotation and for providing mixed filtered phase signal component outputs to the output nodes (Fig. 3, element 36).

Mole does not disclose an IIR filter.

In the same field of endeavor, however, Staszewski discloses coupled to the input node, an IIR filter further comprising: a buffer capacitor for buffering input current; rotating

capacitors coupled to the buffer capacitors (page 5, paragraph 61 – page 6, paragraph 67; page 6, paragraph 66; page 7, paragraph 82).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Staszewski, in the system of Mole because this would allow for an implementation that requires less hardware than an FIR implementation, as is well known in the art and also disclosed by Staszewski (paragraph 61).

Regarding claim 17, Mole does not disclose a sigma-delta analog-to-digital converter.

In the same field of endeavor, however, Staszewski discloses the direct sampling mixer comprises a sigma-delta analog-to-digital converter (page 8, paragraph 88).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Staszewski, in the system of Mole because this would allow for dynamic range advantages, as is well known in the art.

Claims 18 – 21 are similarly analyzed as claims 10 – 13 respectively.

***Allowable Subject Matter***

12. Claim 14 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Other Prior Art Cited***

The prior art made of record and not relied upon is considered pertinent to the applicant's disclosure.

The following patents are cited to further show the state of the art with respect to image rejection in mixers:

Staszewski et al. (US 5 20030083033) discloses Sampling mixer with asynchronous clock and signal domains.

Staszewski et al. (US 20030040294) discloses Efficient charge transfer using a switched capacitor resistor .

Souetinov et al. (US 6,324,388) discloses an image reject mixer circuit arrangements.

Salminen (US 6,574,457) discloses a Two-transistor mixer.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Adolf DSouza whose telephone number is 571-272-1043. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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